PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY

VOL. I. NOVEMBER & DECEMBER, 1840. No. 14.

Stated Meeting, November 6.

Present, twenty-four members.

Mr. DU PONCEAU, President, in the Chair.

Dr. Dunglison, Reporter, stated that No. 13 of the Proceedings of the Society was ready for distribution, and placed a copy thereof on the table.

The Committee, consisting of Mr. Walker, Dr. Patterson, and Prof. Bache, to whom was referred a paper, entitled "Observations upon the Meteors of August, by C. G. Forshey, &c. &c.," reported in favour of publication in the Society's Transactions, which was ordered accordingly.

The principal points discussed in this paper are noticed in an oral communication made by Mr. Walker on the 21st of August. (See Proceedings, No. 13, p. 261.)

The Committee, consisting of Dr. Patterson, Prof. Bache, and Mr. Walker, to whom was referred a communication from Mr. Nulty to Mr. Lea, on a new property which he had found in his Magic Cyclovolute, described in the seventh article of the fifth volume of the Society's Transactions, reported that they had learned from the author, that his communication was not intended for the Transactions, and that he did not desire it to take that destination; they therefore requested to be discharged, which was ordered accordingly.

The new property is as follows: "The eight volutes which originate at the extremities of the principal diameters, AA′, BB′, are divided by these diameters, so that every *four numbers* along each volute, both towards its origin and the centre of the interior circle, with half the *central number twelve*, make 180." This property, Mr. Nulty remarks, is analogous to the third, mentioned in his paper; distinguishes the particular set of numbers which he had selected from other sets possessing the properties already noticed, and renders his drawing more general, and the arrangement, there presented, *unique*.

A communication was read, entitled "Observations to determine the Magnetic Intensity at several Places in the United States, with some additional Observations of the Magnetic Dip, by Elias Loomis, Professor of Mathematics and Natural Philosophy in Western Reserve College," which was referred to a Committee.

Professor Bache submitted to the Society a Chart, representing the extraordinary variations of the magnetic declination during the term day, on the 29th of May last, prepared by W. C. Bond, Esq., from the observations at the Magnetic Observatory at Cambridge.

Dr. Horner read a paper on the dental system of the Mastodon, which was referred to a Committee.

Professor Bache read an extract of a letter from Lieut. Riddell, Director of the Magnetic Observatory at Toronto, U. C., which stated that an entire discordance had been found between the curve representing the changes of inclination, on the February magnetic term day, at Toronto, Dublin, Brussels, and Prague, whilst those at the last three named stations agreed very well together. This result, Professor B. stated, confirms the conclusions previously drawn from the observations at short intervals, of Prof. Lloyd and himself, in November last.

Mr. Walker made some observations in relation to the Observatory of the Harvard University, Cambridge, and stated that extensive arrangements had been made, and were in con-

templation, for prosecuting magnetic observations and practical astronomy.

Professor Bache made a verbal communication of some recent determinations of the magnetic dip, made by him at Philadelphia and Baltimore.

He reminded the Society, that on a former occasion he had submitted a comparison of the observations for magnetic dip at various stations, common to the series of Professor Loomis (Am. Philos. Soc. Trans. Vol. VII. N. S.), and to that of Professor Courtenay and himself. The discrepancies at Philadelphia and Baltimore were among the most striking. Having satisfied himself that the dip given by his instrument at the station occupied by Prof. Loomis, near Philadelphia, was sensibly the same as that given by Prof. Loomis, his next step was to ascertain, by observations in a different position from those used in both the sets of observations formerly made, which probably represented more correctly the dip at Philadelphia. The result of two series of observations near the observatory at the Girard College (at a sufficient distance to be beyond sensible influence from the magnetic instruments), made with four different needles, was as follows:

July 21, 1840. No. 1, 71° 51.7′. No. 2, 71° 51.7′. Mean of Lloyd, No. 1 and No. 3, 71° 55.8′.

November 2, 1840. No. 1, 71° 51.2′. No. 2, 71° 51.0′. Mean of Lloyd, No. 1 and No. 3, 71° 57.4′.

Mean, 71° 53.3′.

The needles, termed Lloyd No. 1 and No. 3, are used without reversing the poles; and a correction has been applied from the mean of sixteen comparisons, with the ordinary needles, at different places: as, however, this correction is obtained through Nos. 1 and 2, the results merely add to the number of observations from which the mean is obtained.

Prof. Bache remarked that his former result was thus confirmed.

At Baltimore, the place of observation was in the second square, N. E. of the Washington Monument. The same needles were used.

Aug. 27, 1840. No. 1, 71° 31.7′. No. 2, 71° 39.1′. Mean of Lloyd, No. 1 and No. 3, 71° 32.4′. Mean, 71° 34.4′, differing from the results of both the former series.

Prof. Bache stated, in continuation, that the geological formations

at and near Baltimore, rendered it difficult to select an unexceptionable site for magnetic observations there, and was a sufficient explanation of the observed discrepancies. The results, which he had at present obtained, differed about 10′ from the mean of those of Professors Courtenay and Loomis.

Dr. Patterson announced the death of Prof. Charles Bonnycastle, a member of this Society (elected at the last meeting), which took place on the 31st of October.

Mr. Du Ponceau announced the death of Mr. Sylvanus Godon, a member of the Society, who died on the 17th of October.

The Observatory Committee submitted a report, in part, on the subject of the fund raised for the erection of an Observatory, and proposed the following resolutions, which were adopted:

Resolved, That if the City Councils shall grant to the Society the privilege of erecting an Observatory in Rittenhouse Square, the Society will pledge $5000 of the Astronomical Fund for this object, under such conditions as they shall hereafter prescribe.

Resolved, That when it shall be ascertained that the proposed Observatory can be erected, the Observatory Committee be authorized to solicit and receive subscriptions for such additions to the Astronomical Fund, as may be rendered necessary by the undertaking.

Stated Meeting, November 20.

Present, thirty-three members.

Mr. Du Ponceau, President, in the Chair.

A letter was read from Mr. F. Markoe, Jr., Corresponding Secretary of the National Institution for the Promotion of Science, recently established at Washington, addressed to the Secretaries of the Society, announcing officially, to the Society, the fact of the foundation of the Institution at the seat of government, and the objects which it has in contemplation; and soliciting for the Institution the correspondence of the

Society, and its co-operation and aid in promoting the objects with which the Institution was founded:

Whereupon the Secretaries were directed to reply, that the National Institution would be enrolled in the list of correspondents of the Society, and that the Transactions and Proceedings of the Society would be regularly transmitted to it.

Dr. Patterson, from the Observatory Committee, reported, that an ordinance had passed the City Councils, authorizing the erection of an Astronomical Observatory within Rittenhouse Square.

Professor Bache read a continuation of the paper of Professor Loomis on Magnetic Dip and Intensity, the reading of which was commenced at the last meeting. It was referred to the Committee which has the first portion under consideration.

Professor Henry read the sequel of his communication, entitled "Contributions to Electricity and Magnetism, by Joseph Henry, LL.D., &c. &c., Professor of Natural Philosophy in the College of New Jersey, Princeton. No. IV. On Electro-dynamic Induction (continued)," which was referred to the same committee as the former "Contributions."

Mr. Cresson exhibited specimens of naphthaline, obtained by a kind of irregular crystallization from the liquid produced by the distillation of coal tar at a high temperature.

Prof. Bache stated, that along with Messrs. Walker, Kendall, Cresson, Frazer, and a pupil of the High School, he had watched for meteors or shooting stars, at the High School, on the nights of Nov. 12–13, and 13–14, and met with the usual negative results of the observations before made in Philadelphia.

On the evening of the 11th, clouds came up from the E. N. E. soon after 9 o'clock, and finally covered the whole sky, which remained overcast during the night. On the nights of the 12th–13th, and 13th–14th, the sky was remarkably clear, except towards the horizon, on the morning of the 13th, and during a small part of the morning of the 14th.

From 11 to 12 on the night of the 12th, there were three observers; and the space embraced by their observations was that part of the visible heavens from the east round to the north, through the south. The moon was up, having passed the full about two days. During this hour six meteors were counted. From 12 until 4 A. M. of the 13th, there were two observers taking in a range of rather more than half the visible heavens. Eighteen meteors were counted, namely, nine between 12 and 1, three between 1 and 2, and six between 2 and 4 A. M. The paths of nine of these meteors were ascertained to converge to the region occupied by the head of the Lion, eight were variously directed, seven were doubtful or not ascertained. Of all the meteors seen, one appeared as large as Sirius seen by the naked eye, three as stars of the first magnitude, one of the second, three of the third, five of the fourth, and three of the fifth; the magnitudes of eight were not noted.

Two observers were on the watch on the evening of the 13th and morning of the 14th, from 11 o'clock until 4, except for half an hour at 2 A. M., the portion of the sky embraced in the observations being from the east to the west, through the south. The total number of meteors counted was seventeen. The paths of eight of these passed, when produced, towards the Lion's head, seven were in other directions, two not noted, or doubtful. Three were of the second magnitude, six of the third, five of the fourth, and one of the fifth; two were not noted.

The apparent velocities noticed of meteors having a common radiant, or nearly so, were as follows:

Path of 8° described in .8″ from γ Pegasi, vertically downwards.

3° to 4° in .7″ from α Andromedæ, downwards.

17½° in .4″ obliquely from a point midway between the Pleiades and Aldebaran, on a line which, if produced, would pass through Castor.

Dr. Horner called attention to the noise and shock observed about 9 o'clock on Saturday evening last (Nov. 14), which were supposed by some to be those of an earthquake. Judge Hopkinson referred to a statement, that the phenomena were supposed to be produced by the explosion of a near meteor. Mr. Nicklin mentioned facts, which induced him to think there had been a slight shock of an earthquake at the time

mentioned. Dr. Chapman and Mr. Cresson attributed the rumbling noise and shock to thunder. Dr. Chapman had noticed a flash of lightning near the horizon, which was followed by thunder. Mr. Cresson had noted an interval of nearly two minutes between the flash of lightning and the clap of thunder.

Prof. Henry described an apparatus for producing a reciprocating motion by the repulsion in the consecutive parts of a conductor, through which a galvanic current is passing; and made some remarks in reference to the electro-magnetic machine invented by him in 1829, and subsequently described by Dr. Ritchie, of London. The machine referred to had been applied recently by Prof. Henry in his experiments.

Mr. Fisher announced the death of Benjamin R. Morgan, a member of the Society, who died on Nov. 19.

Dr. Patterson stated on behalf of Mr. Gillies, of Washington—introduced at the meeting as a member of the National Institution of Washington—that he had watched for meteors at Washington on the nights of the 11th, 12th, 13th, and 14th of November, but had failed to observe any on these occasions.

Prof. Bache communicated an extract of a letter from Prof. Rümker, Director of the Observatory of Hamburg, which contained the results of his observations of Galle's first comet, and occultations observed in April, May, June, and August, 1840.

1839.	Mean Time at Hamburg.	Apparent AR of Comet.	Apparent Declination of Comet.	Number of Observations.	Apparent Position of Compared Stars.	
					Stars' Apparent AR.	Stars' appar't Declination.
10 December	16 23 39.93	13 52 37.457	+0 27 5.70	7	13 51 29.987	+0 36 41.69
	18 4 33.76	13 53 18.895	28 5.12	1	13 51 32.694	0 49 44.42
					13 54 22.953	0 49 10.05
14 December	16 22 7.34	14 31 59.396	+1 39 28.08	5	14 28 24.131	+1 45 19.39
					14 30 6.264	1 34 49.44
					14 37 20.656	1 23 41.84
					14 38 56.172	1 38 42.26
25 December	19 4 17.893	16 13 56.08	+3 22 6.28	8	16 14 12.633	+3 15 19.94
					16 14 17.976	3 27 56.03
28 December	18 36 30.58	16 37 37.126	+3 18 46.68	3	16 37 44.606	+3 11 29.95
	19 14 44.16	16 37 49.663	3 18 9.17	2	16 37 54.335	3 4 57.74
					16 40 17.438	3 1 30.22
29 December	17 4 13.93	16 44 42.317	+3 14 19.28	3	16 43 27.640	+3 12 16.89
					16 45 13.424	3 17 18.51
1840.						
4 January	17 49 15.85	17 26 17.213	+2 23 30.42	10	17 22 29.946	+2 9 22.17
					17 22 38.602	2 27 12.28
					17 23 49.909	2 22 29.20
					17 24 18.048	2 10 34.13
					17 24 22.025	2 31 52.69
5 January	17 41 29.78	17 32 31.084	+2 11 58.07	3	17 30 59.317	+2 8 55.01
					17 31 2.991	2 7 19.08
					17 31 50.266	2 6 38.84
6 January	17 56 29.89	17 38 40.337	+1 58 52.01	16	17 39 9.522	+1 53 20.01
					17 39 31.944	1 50 30.22
					17 40 39.371	1 49 1.42
					17 41 13.764	2 0 44.12
					17 44 27.507	1 45 0.75

											17	47	59.205	+1	27	31.08
											17	51	23.084	1	34	31.33
8 January	18	18	9.53	17	50	28.758	+1	30	54.70	15	17	52	13.499	1	37	16.71
											17	53	37.164	1	18	45.14
9 January	18	13	18.80	17	56	5.600	+1	16	21.12	10	17	53	37.184	+1	18	44.99
											17	56	23.938	1	13	54.69
											18	0	26.800	+0	41	44.89
											18	1	31.193	0	47	50.57
10 January	18	19	49.87	18	1	36.743	+1	0	51.489	19	18	2	15.637	0	46	3.82
											18	3	32.293	0	46	47.63
											18	5	33.517	0	38	37.75
11 January	18	52	4.70	18	7	4.540	+0	45	4.37	7	18	5	33.526	+0	38	37.66
											18	8	55.993		57	9.76
											18	9	57.366	+0	47	50.24
12 January	18	18	25.36	18	12	9.719	+0	29	35.40	16	18	10	29.575	0	41	40.95
											18	11	16.032	0	46	44.50
											18	19	0.541	+0	6	13.50
13 January	18	32	14.97	18	17	18.786	+0	13	1.21	14	18	19	37.832	+0	6	16.66
											18	21	4.867	+0	13	22.95
											18	19	0.561	+0	6	13.31
14 January	18	15	17.68	18	22	12.686	−0	3	9.628	8	18	19	37.851	0	6	16.52
											18	21	4.885	0	13	22.81
											18	22	25.701	0	16	26.05
	17	48	49.85	18	36	21.422	−0	53	20.42	4						
17 January	18	26	33.84	18	36	28.285	−0	53	41.99	3	18	38	12.035	−1	7	38.56
											18	40	58.875	−1	9	32.47
19 January	18	43	46.66	18	45	26.533	−1	27	12.03	4	18	43	21.286	−1	13	50.53
21 January	18	37	1.19	18	53	58.738	−1	59	42.44	2	18	57	0.326	−1	45	3.59
22 January	18	38	58.60	18	58	6.639	−2	16	22.92	1	18	58	37.939	−1	58	41.10
2 February	18	16	33.06	19	38	28.796	−5	0	40.85	1	19	33	20.046	−4	39	35.04
											19	36	47.391	−4	54	23.53
4 February	18	14	45.53	19	44	57.405	−5	26	57.39	1	19	42	19.830	−5	5	47.89
											19	45	45.551	−5	27	34.24

The places of the stars are the apparent places for the time of comparison with the comet.

Prof. Bache also reported the following occultations of fixed stars by the Moon, observed by Prof. Rümker in Hamburg.

1840.	Star.	Phase.	Mean Time at Hamburg.
April 11	ν Leonis	Immers.	10 34 58.29
22	τ Sagittarii	Immers.	16 13 20.77
May 4	Anon.	Immers.	10 30 16.97
June 3	ι Cancri	Immers.	9 48 30.98
Aug. 24	* Cancri	Immers.	16 13 35.8
	* Cancri	Immers.	16 16 7.9

Stated Meeting, December 4.

Present, thirty members.

Mr. Du Ponceau, President, in the Chair.

The Committee, consisting of Mr. Richards, Dr. Ludlow, and Mr. G. M. Wharton, on a communication of Professor Forshey, of Natchez, containing a description of the great Mound near Washington, Adams County, Mississippi, reported favourably of the same, and expressed the hope, that the author might be enabled to prosecute farther examinations, "the result of which, with his enlightened commentaries, would furnish a most acceptable addition to the Transactions of the Society."

The Mound, described by Professor Forshey, is found about nine miles northeast from the city of Natchez, Mississippi, upon the most elevated portion of that comparatively low and level region. It is approached on all sides by a slope. The elevation of its base above the mean level of the waters of the Mississippi, at Natchez, is estimated at 265 feet, and the greatest height of the Mound above the earth, 84 feet. The whole elevation above the waters of the river 348 feet, giving to the spectator a clear horizon of 150 degrees, embracing, in that flat region, a rich and extended prospect.

The Mound is an irregular artificial elevation of earth, varying, in its general line, from 40 to 46 feet in height, and encloses an area of about seven acres inclusive of the ground covered by its base. On the surface of the general Mound are erected, at irregular intervals, 15 smaller Mounds, one of which is 38 feet in height, and the remaining 14 varying from 4 to 12 feet in height. The Mound consists of clay, with some admixture of earth, and its sides seem to have been faced with rudely formed brick, made from the adjacent clay. The bricks are found after digging to the depth of some 12 or 15 inches into the embankment. The western front is ascended by two causeways, which are distinctly marked, and are found one at each angle of the Mound. At the eastern extremity is another causeway entrance to the enclosure, and near to this entrance, and outside the embankment, may be traced, for some distance, an ancient fosse. The three causeways are of easy ascent, and wide enough for the introduction of burthens. Upon the north and south sides of the great Mound, and at points nearly opposite to each other, covered entrances or archways were constructed, but they are now so obstructed as to be difficult of examination. Before the forest was cleared by civilized culture, tradition relates that extensive avenues reached north, south, east, and west, thus affording, from the elevation of the great Mound, a most attractive prospect.

The result of the partial examinations made, shows that portions of the Mound were used as places of interment by the Indians. The cranium secured by Prof. Forshey was of the tribe of Flatheads.

Earthen vessels of rude construction, and probably used frequently as receptacles for the remains of those interred, or as mementos at their funeral obsequies, are found. Various objects from the Mound have reached the Lyceum at Natchez.

The Committee, consisting of Mr. Lea, Dr. Hays, and Mr. Ord, to whom was referred a communication, entitled "Remarks on the Dental System of the Mastodon, with an Account of some Lower Jaws in Mr. Koch's Collection, St. Louis, Missouri, where there is a Solitary Tusk on the Right Side, by William E. Horner, M.D., Professor of Anatomy in the University of Pennsylvania," reported in favour of the publication, which was directed accordingly.

Dr. Horner inquires into the mode of formation of the teeth of the Mastodon, and compares it with that of the elephant and of man. The teeth of the Mastodon are all formed upon one type of configuration, the number of denticules excepted; they, therefore, like those of the elephant, do not admit of a division into incisors, cuspidati, and molares, as in some other animals. The teeth are all molars. The lower jaw itself resembles somewhat a human lower jaw cut off in front of the molar teeth, and then joined in the two posterior segments. These teeth invariably succeed each other from behind; the hindmost, as they emerge, pushing the others forward, and out of their places, until the latter all drop out, and a large solitary tooth is finally left on each side of each jaw.

Dr. Horner alludes to the erroneous nature of the early ideas of naturalists on the teeth of the Mastodon, and observes that we now know, with some degree of certainty, that the earliest teeth of this animal were not more than an inch and a half square, and that the three immediately succeeding were a gradual and successive enlargement on this and on each other's volume In the Museum of Mr. Koch, at St. Louis, there is a young head, the long diameter of which is 18 or 20 inches, where the fact of four coexistent teeth on each side of each jaw is exhibited. This specimen, with a dozen lower jaws of different ages and sizes, enables us to trace, with some accuracy, the stages of dentition, until it reaches the large and solitary grinder of ten inches in length on each side. Judging from these phases of dentition, Dr. Horner infers that the entire amount of teeth was at least 24; he is disposed, indeed, to think that the number may have been greater than this; perhaps 28, and possibly 32.

Dr. Horner makes some observations on some specimens of lower jaws in Mr. Koch's Museum in St. Louis, in which there was a solitary tusk on the right side, and alludes to the embarrassments that their existence occasions in regard to the Tetracauledon of Godman; whether, for example, we are to consider them merely as abnormous types of that animal, as known Mastodons, or as still another species to which, if such, the name Tricaulodon might be attached. Dr. Horner confesses himself unable to suggest a probable solution of these questions, and states, in connection with them, that Mr. Koch has the lower part of the head of a Mastodon of middling size, in which, from the intermaxillary bone, as usual, protrudes a tusk, which measures thirty inches long by four inches in diameter; but

the tusk exists only on the left side, there being not even a vestige of alveolus on the right.

It is very far from being certain, Dr. Horner adds, that any example exists of the upper jaw of the Tetracauledon; the presence of tusks in both jaws at once has therefore to be yet proved.

The Committee, consisting of Prof. Bache, Dr. Patterson, and Mr. Lukens, to whom was referred the paper, entitled "Observations to determine the Magnetic Intensity at several Places in the United States, with some additional Observations of the Magnetic Dip, by Elias Loomis, Professor of Mathematics and Natural Philosophy in Western Reserve College," recommended the same for publication in the Society's Transactions, which was ordered accordingly.

The following is an abstract of the results of observations contained in this memoir.

1. Magnetic Intensity.—The horizontal intensity was observed by an apparatus similar to the one used by Professor Hansteen. Three small needles, furnished to the author by Professor Renwick, and made under the direction, respectively, of Professor Hansteen, Major Sabine, and Professor Henry, were employed. The commencing semi-arc of vibration was, in every case, 30°, and each series included 320 oscillations, the instant of the completion of every tenth vibration being noted. No correction, therefore, is applied for the arc of vibration. The times were observed at Dorchester, Princeton, and Philadelphia, by a chronometer, and at the other stations by a lever watch, which, at Hudson, was compared with the observatory clock before and after the observations. The author remarks, that "at the remaining stations there is a little uncertainty with regard to the time, yet it is thought its influence upon the results will not be great."

The correction for temperature, for each of the needles, was obtained by direct experiment, and gave the following coefficients:

For the Hansteen needle, .000191; for the Sabine needle, .000328; for the Henry needle, .000116. The results of observation are reduced to a standard temperature of 60° Fah.

The author gives the reasons which induce him to apply no correction for the change of magnetism in the needles. The observa-

tions for horizontal intensity were principally made in September and November, 1839.

The stations of observation at different places were the same as formerly described (Am. Phil. Soc. Trans.), except at Dorchester, which was near Mr. Bond's Observatory. The details of the observations are given, and from the mean of those for horizontal intensity, combined with the dips formerly observed, the author gives the total intensities, taking New York as 1.803, according to the determination of Major Sabine, and referring to the unit established by Humboldt, as follows:

	Horizontal Intensity.	Dip.	Total Intensity.
New York,	.96707	72° 52.2′	1.803
New Haven,	.92364	73 26.7	1.780
Dorchester,	.88182	74 16.0	1.786
Providence,	.89830	73 59.6	1.789
Princeton,	.97414	72 47.1	1.807
Philadelphia,	1.00000	72 07.0	1.788
Hudson,	.97344	72 47.6	1.807

The author remarks that Hudson, Ohio, and New York, thus appear to have sensibly the same magnetic dip and intensity. He concludes this part of his memoir with a comparison of his intensity observations with those of Professors Bache and Courtenay.

2. Magnetic Dip.—This section commences with an account of observations of the magnetic dip, made at Hudson, Ohio, in different azimuths, to try the figure of the axles of the dipping needles. The results for needle No. 1 were quite satisfactory, and for needle No. 2, showed a difference in the extremes of 12.7′: upon a review of the whole, the author considers them as justifying confidence in the needles used.

The following determinations of the dip are next given:

		Latitude.	Longitude.	Date.	Magnetic Dip.
		° ′	° ′		° ′
Hudson,	Ohio,	41 15 N.	81 26 W.	April 15, 1840	72 53.2
Aurora,	„	41 20	81 20	Sept. 8, „	72 55.5
Windham,	„	41 15	81 03	„ 8, „	73 03.4
Bazetta,	„	41 20	80 45	„ 9, „	72 59.7
Kinsman,	„	41 30	80 34	„ 10, „	73 08.1
Hartford,	„	41 19	80 34	„ 10, „	72 59.8
Warren,	„	41 16	80 49	„ 11, „	73 00.7

	Latitude.	Longitude.	Date.	Magnetic Dip.
	° ′	° ′		° ′
Cleveland, Ohio,	41 30	81 42	Sept. 22, 1840	73 12.0
Bedford, „	41 24	81 32	„ 23, „	72 58.0
Twinsburgh, „	41 20	81 26	„ 23, „	72 51.3
Tallmadge, „	41 06	81 26	„ 28, „	72 50.1
Shalersville, „	41 15	81 13	Oct. 15, „	72 56.6
Streetsboro', „	41 15	81 20	„ 16, „	72 53.0
Tallmadge, „	41 06	81 26	„ 31, „	72 48.2

Dr. Patterson, from the Observatory Committee, laid before the Society the following Ordinance, passed by the City Councils on the 19th of November last.

"An Ordinance to authorize the American Philosophical Society to erect an Observatory in Rittenhouse Square.

"Sect. 1. *Be it ordained and enacted by the citizens of Philadelphia in Select and Common Councils assembled*, That the American Philosophical Society be and they are hereby authorized to erect, at their expense, an Observatory in Rittenhouse Square, the same to be built under the supervision of the Committee on City Property, and after a plan to be approved by them; subject, nevertheless, to the right of the Mayor, Aldermen, and Citizens of Philadelphia, to prescribe regulations for the government and management thereof, and at any time the Select and Common Councils may deem it expedient, to take possession of and remove the said building from the said square."

Signed by the Presidents of the Select and the Common Council.

Whereupon it was resolved, that the terms of the Ordinance be accepted by the Society, and that the Observatory Committee be instructed to take the necessary measures, under the powers given them, for carrying the objects of the Ordinance into effect.

Mr. Walker read a communication, entitled "Researches concerning the Periodical Meteors of August and November, by Sears C. Walker," which was referred to a Committee.

Prof. Bache brought before the Society an instrument for measuring the changes in the vertical components of the force of terrestrial magnetism, which he described as combining the

principles of the vertical force instrument of Prof. Lloyd, with that of reflection adopted in the magnetometers of Prof. Gauss, and which had been made for him by Mr. Saxton.

Prof. Bache stated, that having found difficulties in the use, especially by his assistants, of the vertical force instrument invented by Prof. Lloyd, and made for the Magnetic Observatory at the Girard College, by Robinson, of London, he had applied, in June last, to Mr. Saxton, to construct the instrument now presented to the notice of the Society. The details had been matured by conference with Mr. Saxton. The magnetic bar, placed and supported as in the instrument of Prof. Lloyd, carries a mirror upon its axis. The mode of adjusting the position of the centre of gravity of the needle does not differ materially from that adopted in the instrument referred to. The needle is raised off the agate planes by the action of a screw, raising a bar which supports two small cups adapted to receive two projecting pins on the arms of the magnet. This magnetometer is observed from a distance, like those of Prof. Gauss. Prof. Bache explained the mode of adjusting the instrument, and of placing the scale and telescopes.

Mr. Peale remarked, that in the November number of the "London, Edinburgh, and Dublin Philosophical Magazine," there were communications "On the Electricity of a Jet of Steam issuing from a Boiler," and stated that sparks, of the kind mentioned, had been observed in a steam-engine at Wilmington, North Carolina.

Mr. Boyé read a communication, entitled, "On the Perchlorate of the Oxide of Ethule, or Perchloric Ether, by Clark Hare and Martin H. Boyé," which was referred to a Committee.

Professors Rogers and Hare referred to circumstances connected with the discovery, mode of preparing, and preserving this highly explosive compound; of which a specimen, dissolved in alcohol, was presented by M. Boyé to the Society. Dr. Hare, amongst other matters, remarked, that this is the only ether which is explosive, *per se*, when transferred from one vessel to another.

Prof. Bache called the attention of the Society to a diagram

representing the changes of magnetic declination, as recorded at the Magnetic Observatory of Mr. Bond, at Cambridge, and at the Girard College, on the magnetic term day of May, 1840, and showing that the changes attending the aurora are not peculiar to one locality, but that, as observed at different places, they are parts of a great magnetic disturbance.

The two curves thus presented agreed remarkably in all their general features, showing as a general result, similar motions of the needle at the two places in direction, though not always proportional in amount. They presented remarkable differences in the absolute times at which these movements had taken place at the two stations, the similar movements differing frequently five minutes (with opposite signs), and in a few cases as much as ten minutes in time; in other cases being simultaneous. The period at which the needle had attained, suddenly, its greatest deviation from the true meridian, was ten minutes earlier in absolute time at Cambridge, than at Philadelphia.

Mr. Justice reported, that during the last four or five evenings, he had tested the value of the telescope referred to at a former meeting of the Society (Proceedings, No. 13, p. 276), by observations on the Moon, and stated his opinion of its excellence, as deduced from those observations. Mr. Justice detailed the appearances presented by the Moon's surface through this instrument.

Dr. Demmé referred to the contents of a circular letter from Germany, in which it was stated, that a number of gentlemen of Stuttgart had united, under the name "Societas Bibliophilorum Stuttgartiæ," to publish historical and antiquarian works, which are either out of print, or have never been printed.

The Society at Stuttgart will begin to publish as soon as they have procured five hundred subscribers. The subscription is one pound sterling, for which the subscriber will receive one copy; and no more copies will be printed than are subscribed for. The letter to Dr. Demmé, which accompanied it, requested the honour of enrolling the American Philosophical Society amongst the subscribers.

On motion, the Society resolved to subscribe to the undertaking.

Professor Bache read a letter from Major Sabine, giving the progress of the magnetic observations now making, and referring to the modes deemed advisable for the publication of the records of observatories. He referred also to the anomalous nature of the curves for the May term day at Toronto and at Greenwich, and to an instrument for observing vertical force by reflection, in the putting up of which Professor Airy was engaged.

Stated Meeting, December 18.

Present, thirty-eight members.

Mr. Du Ponceau, President, in the Chair.

The Committee, consisting of Dr. Patterson, Prof. Bache, and Mr. Lukens, to whom was referred the communication of Prof. Henry, entitled "Contributions to Electricity, No. IV., on Electro-dynamic Induction," reported in favour of publication, which was directed accordingly.

In this paper Prof. Henry has collected such parts of his researches as particularly relate to the induction at the moment of making and breaking a galvanic circuit, and presents them as the continuation, and, in a measure, as the completion of this part of the general subject of his "Contributions."

The paper is divided into three sections: the first of these relates to the induction at the beginning of a galvanic current. It will be recollected that the arrangement of apparatus employed in the last series of experiments produced a powerful shock at the moment of the ending of the current; but a very feeble one at the beginning. In order, therefore, to study the induction in the latter case, the attention of Prof. Henry was first directed to the discovery of some means by which its intensity could be increased, and after some preliminary experiments, the desired result was obtained, by using a compound Daniel's battery, instead of the single battery before employed. It

was also found, that the shock could be increased by diminishing, within certain limits, the length of the primary conductor.

After detailing a number of new facts relative to the induction at the beginning as well as at the ending of a galvanic current, an account is given of the production of currents, of different orders, from the beginning induction. These are found to be of the same nature as the several currents produced by the induction as the ending of the current, as described in Prof. Henry's last paper—each induced current possessing the property of inducing a current in an opposite direction to itself; and hence a series of alternating currents is exhibited in the case of this induction, similar to that described in Prof. Henry's last communication in reference to the ending induction. The same neutralizing effect is also produced by the interposition of a plate of metal between the conductors of the different orders.

The second section relates to a class of phenomena which at first sight would appear to indicate the existence of two kinds of electrodynamic induction. A brief account of the principal part of these has been given in the Proceedings of the Society for October, 1839. The attention of Prof. Henry was directed to this part of his investigations, by a statement in the 14th series of Dr. Faraday's researches, which was apparently in contradiction to one of the most important facts given in the last number of his "Contributions." It is stated in substance, in Prof. Henry's last paper, that when a plate of metal is interposed between the coil, and a helix placed above it to receive the induction, the shock is almost entirely neutralized. Dr. Faraday, in apparent opposition to this, found that not the least difference in effect is produced, whether the space between the conductors is occupied with a conductor of electricity or not, provided the interposed substance be not of the magnetic kind. A series of experiments was instituted to discover the cause of the discrepancy; and it was found, that in the case of induction produced by the motion of a helix towards a galvanic current, no screening influence was indicated by the deflections of the needle of a galvanometer; also, when the induction was effected by moving a battery up and down in the acid, and in the case of magnetic electricity produced by the motion of the keeper towards the poles of a magnet, the interposition of the plate of metal produced no change in the indications of the needle. The induced electricity—which is thus produced by motion, and is of such low intensity as only to affect the galvanometer, which does not cause

shocks, and is not neutralized by a plate of metal—was at first thought to be of a different kind from that induced by the sudden ending of a galvanic current. In reference to this idea, a new examination was made of the phenomena of the screening influence of the plate, in the case of the induction at the making and breaking of a galvanic circuit, and it was found, that the neutralizing effects, described in Prof. Henry's last paper, only existed in reference to the shock, and the power of magnetizing steel needles, while the indications of the galvanometer were not at all influenced by the presence of the plate: also, that the shock and deflections of the needle appeared to depend on entirely different conditions, and gave, in almost every case, very different indications of the amount of inductive action. Thus, in the arrangement of an apparatus, which gave an intense shock at the breaking of a galvanic circuit, and a very feeble one at the making of the same, the deflections of the needle were as great in the latter case as in the former. It was also found, that although the shock, from the currents of the third and fourth orders, was very severe, yet the galvanometer was scarcely moved by them.

From all these results, Prof. Henry was at first inclined to believe, that there were two kinds of electro-dynamic induction, or that the induced current consisted of two parts, one of which could be neutralized by a plate, and the other not; but after an attentive study of the whole subject, he was led to conclude, that these facts, as well as all those belonging to galvanic induction, given in his former papers, could be referred to the simple laws of the induction in different directions at the moment of making and breaking a galvanic circuit.

The third section of the paper is occupied with these theoretical considerations, and in this Prof. Henry shows, that if the fact be granted, that the deflection of the needle is due to the whole amount of induced electricity, whatever may be its intensity, all the phenomena may be explained by the different degrees of rapidity with which a given amount of inductive action is expended.

When the development or the diminution of the quantity of a galvanic current is sufficiently rapid, a shock is produced; but if the same amount of development is produced more slowly, no shock perhaps will be obtained, although the deflection of the needle will be as great as before. The neutralizing effects of the interposed plate, in reference to the shock and not to the needle, are direct consequences

of these principles, and most of the perplexing phenomena, described in Prof. Henry's last papers are referred to the same cause.

Prof. Henry illustrates his views by the artifice of a curve, the abscisses of which represent the time of the increase or diminution of the quantity of a current, and the ordinates the amount of inductive force produced by the same.

The Committee, consisting of Mr. Nuttall, Mr. Lea, and Dr. Coates, to whom was referred a communication by Miss Margaretta H. Morris, on the Cecidomyia Destructor or Hessian Fly, reported in favour of publication, which was ordered accordingly.

The Committee express the opinion, that should the observations of Miss Morris be ultimately proved correct, they will eventuate in considerable benefit to the agricultural community, and, through it, to the public. Miss Morris believes she has established, that the ovum of this destructive insect is deposited by the parent in the seed of the wheat, and not, as previously supposed, in the stalk or culm. She has watched the progress of the animal since June, 1836, and has satisfied herself that she has frequently seen the larva within the seed. She has also detected the larva, at various stages of its progress, from the seed to between the body of the stalk and the sheath of the leaves. In the latter situation it passes into the pupa or "flax-seed state." According to the observations of Miss Morris, the recently hatched larva penetrates to the centre of the straw, where it may be found of a pale greenish-white semi-transparent appearance, in form somewhat resembling a silk-worm. From one to six of these have been found at various heights from the seed to the third joint: they would seem to enter the pupa state about the beginning of June.

This fly was not observed by Miss Morris to inhabit any other plant than wheat.

To prevent the ravages of this destroyer of the grain, it will be proper to obtain fresh seed from localities in which the fly has not made its appearance. By this means the crop of the following year will be uninjured; but in order to avoid the introduction of straggling insects of the kind from adjacent fields, it is requisite that a whole neighbourhood should persevere in this precaution for two or more years in succession. This result was obtained, in part, in the course of trials made by Mr. Kirk, of Bucks County, Pa., with some

seed-wheat from the Mediterranean, in and since the year 1837. His first crop was free from the fly, but it was gradually introduced from adjacent fields; and in the present year the mischief has been considerable. As Miss Morris states that the fly has never made its appearance in Susquehanna and Bradford Counties, seed-wheat, free from the fly, might be obtained from these, and probably from other, localities.

The Committee recommend that the conclusion of Miss Morris "may be subjected to the only efficient test—repeated observations and effective trials of the precaution she advises."

The Committee, consisting of Prof. Rogers, Dr. Bache, and Mr. Booth, on a communication, entitled, "On the Perchlorate of Ethule or Perchloric Ether, by Clark Hare and Martin H. Boyé," reported in favour of publication, which was ordered accordingly.

In the above paper, the mode of obtaining the perchloric ether, by subjecting a mixture of sulphovinate of baryta and perchlorate of baryta to distillation, is first described. The authors next detail the precautions to be attended to in preparing and experimenting upon this highly explosive compound. They afterwards describe the appearance and properties of the substance which ranks in that class of organic salts, denominated *ethers*. It is a colourless, transparent liquid, heavier than water, and soluble in alcohol, from which it may be precipitated again, by the addition of water. An alcoholic solution of the hydrate of potassa has the power of decomposing it, forming perchlorate of potassa and alcohol. The most characteristic property of the compound is its tendency to explode from the slightest causes.

Mr. Nuttall presented a continuation of his communication read at a former meeting (Proceedings, No. 13, p. 284), under the title, "On the Corymbiferæ, collected on a Tour across the Continent of North America," which was referred to the same Committee as its predecessor.

Mr. Vaughan read a letter from Mr. J. H. Alexander, of Baltimore, containing very favourable remarks on the construction adopted by Mr. James Green, of Baltimore, for the standard barometer made by him for the Maryland Academy

of Science and Literature, and described in a Report of the Meteorological Committee of the Academy, in 1836.

Professor Bache laid before the Society a Report from Mr. Adams to the House of Representatives, on a Letter from the Secretary of War, of the 31st Dec. 1839; and a Memorial from a Committee of the American Philosophical Society, asking the aid of the Government to carry on a series of magnetic and meteorological observations, and ending with a resolution:

"That the sum of twenty thousand dollars ought to be appropriated for the establishment of five several stations, at suitable distances from each other, for making observations of terrestrial magnetism and meteorology, conformably to the invitation from the Royal Society of Great Britain to the American Philosophical Society at Philadelphia, and to other learned societies in the United States; that the said sum should be placed under the direction, and at the disposal, of the Secretary of War, for the fulfilment of these purposes; he to account for the expenditures, thus authorized, to the Treasury of the United States."

Professor Bache then offered the following resolution, which was adopted:

Resolved, That the Committee by whom a memorial was addressed to the Secretary of War, in reference to the establishment of magnetic observations, be instructed again to call his attention to the system of combined observations on terrestrial magnetism and meteorology now in progress.

Dr. Patterson called the attention of the Society to the subject of the evolution of electricity from steam, mentioned at the last meeting, and stated that the experiments made lately in England had been successfully repeated by Mr. Peale, Mr. Saxton, and himself, at the United States Mint.

Dr. Patterson said, that their first attempts were to collect electricity from the steam as it issued from a gauge-cock, near the surface of the water, in the boiler; but in this case the steam was always accompanied by a spray of water, and the experiments failed. They also failed when the steam was of a low temperature, as it was then condensed immediately upon leaving the boiler, so as to form a cloud

of vesicular vapour. In both these cases, the electricity, if evolved at all, would be led back to the boiler—the spray and the vesicular vapour being, as is well known, electrical conductors.

When, on the other hand, high steam was drawn off from a stop-cock far removed from the water in the boiler, it was observed to issue, for some distance, in the form of a transparent gaseous vapour, and, in this case, any insulated body on which it was condensed was always found to be charged with electricity. Thus, if the experimenter stood on an insulating stool, or even on a box or ladder of dry wood, and held an iron ladle, or any other conductor, in the issuing steam, the conductor and the operator became so fully charged with electricity, that thick sparks of a half, three-quarters, and in some instances a whole inch in length, were drawn off; the Leyden jar charged; the shock given to several persons holding hands, &c. The electricity thus produced was found to be always positive.

Dr. Patterson said, that one of the most important conclusions to which the experiments had led, was, that true gaseous steam is a non-conductor of electricity. If it had not been so, the apparatus would not have been insulated, and the electricity excited would have been carried back to the metallic boiler, and thence to the earth.

Dr. Patterson thought it most probable that the electricity, in these experiments, was evolved by the condensation of the steam—the phenomenon being analogous to the evolution of latent heat by the same condensation. He remarked, that as the steam within the boiler was surrounded by conductors, it could not be supposed to contain free electricity, and that on leaving the boiler, the only sources to which the electricity could be ascribed, seemed to be the condensation of the steam, the oxidation of the iron against which it impinges, or the friction of the steam against the air as it rushes through it.

To show that oxidation was not the source of the electricity, the experimenters caused the steam to strike upon a large bar of fine gold (400 oz. in weight), and the generation of electricity was as abundant as when they employed an oxidizable metal. The electricity was also evolved by the insulated operator simply holding his hand in the steam as it issued; in which case the steam was condensed upon the hand, and the whole person became charged. Dr. Patterson stated, that this was, in fact, the experiment accidentally made near New Castle, in England, and which has attracted so much attention.

To show that the electricity was not caused by the rushing of the vapour through the air, Dr. Patterson said, that an apparatus was made, consisting of a pipe connected with the stop-cock on the boiler, a portion of about ten inches in length, near the upper end, being of glass, to produce insulation, and the remainder of lead, wound into a helix, like the worm of a still. This helix was immersed in a bucket of water and snow. When the steam was admitted, it became entirely condensed within the pipe, so that there was no rush through the air; yet the production of electricity was as abundant as with the former arrangements.

Dr. Patterson took notice of experiments made, half a century ago, by Volta and Saussure, and afterwards by Cavallo, which proved, to their satisfaction, that electricity was evolved during evaporation and condensation, but which have since been called in question by Pouillet and others, who assert, that a mere change of state, not accompanied by chemical change, never gives rise to electricity. He considered the experiments, now made on a large scale, as favouring, if not confirming, the first opinions entertained on this subject.

Dr. Patterson referred to the satisfactory manner in which these new experiments seem to explain the sources of electricity in the thunder storm, and in volcanic eruptions.

He then related an experiment in which an insulated iron ball, and afterwards a bar of gold, was heated, and a small stream of water poured on it, so as to be formed into steam at its surface. The first experiments seemed to show that the metal was charged with negative electricity, but subsequent trials threw doubts upon this conclusion.

Dr. Patterson also described experiments made to determine whether electricity was given off during the solidification of liquids,—the substances used being melted lead, silver, and gold. In every case, however, the gold-leaf electroscope failed to exhibit the presence of any electricity.

Prof. Henry stated that he had not seen the sparks from steam; but that he had obtained feeble electricity from a small ball, partly filled with water, and heated by a lamp. He agreed with Dr. Patterson in the opinion, that the source of the electricity was the change of state, but from water to vapour. There was, however, some doubt on the subject; Pouillet had denied the evolution of electricity from the evaporation of pure water. The facts were interesting, particularly

on account of the great intensity of the electricity. The results, obtained by the philosophers, which had been mentioned, indicated electricity of very feeble tension, which could only be observed by the most delicate instruments, but here the sparks were an inch in length. If the vaporization of the water were shown to be the source of the electricity, Prof. Henry thought that the phenomena might be readily explained by the beautiful theory of Becquerel, in regard to the production of the great intensity of the electricity in the thunder cloud. According to this theory, each particle of the vapour carries up with it into the atmosphere the free electricity, which it receives at the moment of the change of state: this being diffused through the whole capacity of the air, is of very feeble intensity, although of great quantity; but the condensation of the vapour into a cloud affords a continuous conductor, and consequently the electricity of all the particles of the interior, according to the well-known principles of distribution, rushes to the surface of the cloud, and hence the great intensity of the lightning. According to this hypothesis, the insulated conductor, placed in the steam, would act not only as a collector, but also as a condenser of the free, but feeble, electricity of the vapour.

Prof. Henry farther stated, in connection with this subject, that he had been informed by several persons, that they had obtained sparks of electricity from a coal stove during the combustion of anthracite. A case had been stated to him several years ago, which he mentioned to his friend Professor Bache, who informed him that a similar one had fallen under his own notice, in which, however, Prof. Bache had succeeded in tracing the electricity to the silk shirt of the person who drew the spark. Another case had lately been reported to him by an intelligent gentleman, of a stove burning bituminous coal, on board of a steamboat on the Ohio, which afforded amusement to all the passengers during the voyage, by giving sparks of electricity whenever it was touched.

In connection with the facts that had been stated of the production of electricity from steam, Prof. Henry observed that he was now inclined to believe that electricity may also be evolved during the combustion of coal in a stove. But what, he asked, is the source of electricity in this case? Is it combustion, the evaporation of the moisture, or the friction of the hot air on the interior of the pipe?

Dr. Goddard stated, that in the case of a stove, pretty well insulated, his family had amused themselves with drawing sparks half an inch

or three-quarters of an inch long; and that similar sparks were obtained from the frame of a looking-glass over an open grate, in the house of Dr. Norris, of this city.

Prof. Bache remarked, that in the case referred to by Prof. Henry, in which sparks of electricity were obtained from a stove, he had satisfied himself that these were owing to the experimenter wearing a silken shirt: an experimenter, not similarly clad, being unsuccessful.

Dr. Hare ascribed the incredulity and the opinions which he had expressed, when this subject was brought before the Society by Mr. Peale, at the last meeting, to a misapprehension, on his part, as to the circumstances. He considered that the fact of electricity being developed in the case adduced was established. He alluded to the almost incredible case of a lady, who, agreeably to evidence mentioned in Silliman's Journal, gave off sparks of electricity. He stated also the result of an experiment to discover whether electricity was given off during the rapid evaporation of a saline solution. There was no evidence of excitement. The vessel was of glass.

Mr. Lea had frequently observed sparks from a common grate.

In reference to the results of experiments by Dr. Patterson, in which no evidence of the development of electricity was observed in metals, whilst undergoing a change from the liquid to the solid state, Dr. Goddard observed, that in cases of crystallization on the large scale, as of nitre, in the extensive chemical works of Mr. Wetherill, a beautiful flash of electrical light was apparent.

Prof. Rogers suggested, that in ordinary combustion there may be a constant development of electricity, and that means may possibly be found to render it apparent by perfect insulation.

Prof. Henry stated, that Pouillet had found that electricity is developed by the combustion of charcoal, and he offered some suggestions as to the mode of rendering the electricity, given off from a stove, apparent, by insulating it both above and below.

Dr. Emerson thought, that the change of state from solid to liquid, and from liquid to solid, might account for various electrical phenomena presented by the animal body. Dr. Hare suggested the difficulty, that the human body is a good conductor; and that without a peculiar organization, analogous to that with which nature has endowed the Torpedo or Gymnotus, it is inconceivable that electrical discharges could arise from vital organization. He believed it was admitted by electricians, that there could be no electrical excitement

without the existence of the opposite electricities. Agreeably to the published facts of the case to which he had alluded, the lady was permanently in one state of excitement, generating electricity, as animal heat is generated, and throwing off the excess in sparks.

In the case of the Gymnotus the intensity, Dr. Hare remarked, is so low that sparks are with difficulty rendered apparent at a kerf made by a knife in tinfoil; of course, the sparks alleged to be given by the lady were vastly more intense. From the Gymnotus, sparks could only be received by forming a circuit with a portion of the organic series situate parallel to the spine. Contact in a transverse direction was not productive of any discharge.

Mr. Vaughan stated that there had been no application for the Magellanic premium.

Dr. Patterson, from the Observatory Committee, moved that Mr. Justice be added to that committee. The motion was agreed to.

Mr. Vaughan announced the death of M. J. P. F. Deleuze, of Paris, a member of the Society.

FINIS.

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